School of Computing Science & Engineering

Continuous Assessment Test (CAT-III)-June 2022, Semester: Winter, 2021-22

[Programme: B. Tech.] [Semester: II] [Batch: 2021-2024]

Type of Activity : Individual/ Group
Name of Activity :

Course Title: Discrete Mathematics Course Code: MATH2007

MM:30

Instructions:

1. In case of Group activities Maximum 3 students in a group and Same Problem / Case Study can be given to 3 Groups

2. Solutions for the Problems must be unique and report must be minimum of 6 pages and maximum up-to 10 Pages, including Diagrams, Algorithm, Interpretation of Results, Review of Literature etc

3. The Report (PDF, PPT, Docx) must be screened through ithenticate and plagiarism must be less than 10%

4. **SOLUTION SHOULD BE HAND WRITTEN.**

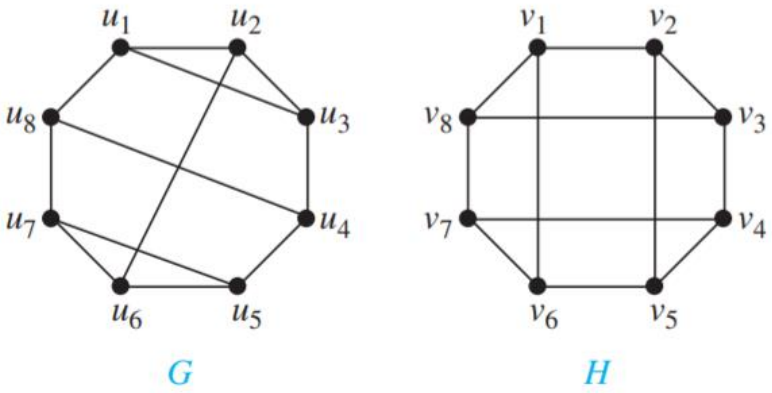
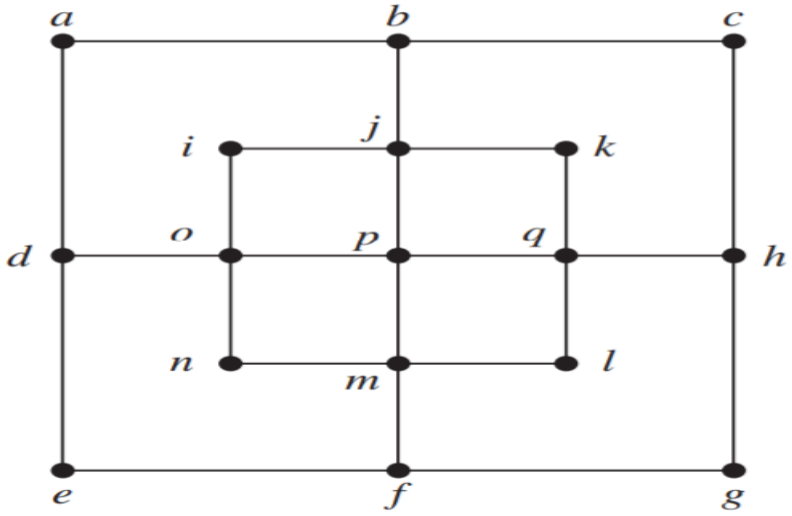
5. **PROPER DEFINITION SHOULD BE WRITTEN FOR THE TERMS AND CONCEPTS IS GOING TO BE USED IN SOLUTION.**

6. **SOLUTION SHOULD BE UPLOADED ON LMS (LESS THAN 1 MB).**

7. **DO WRITE CONCLUSION AFTER GETTING RESULT (FOR SOLUTION WRITING, FOLLOW RUBRICS GIVEN BELOW).**

8. **FILE NAME IS LIKE-----: G1_Q1**

No.	Activity Based Question
1	Let S= {a,b,c,d,e} and P be the set of partitions of S such that P={P1,P2,P3,P4}, where P1={{a,b,c},{d,e}},P2={{a,b},{c,d,e}},P3={{a,b,c,d,e}} and P4= {{a},{b},{c},{d},{e}} A partial order is defined on P such that Pi ≤ Pj, if and only if all the elements of Pi are subsets of elements of Pj. (a) Express the partial order using a Hasse diagram. (b) Check whether it is a lattice. Explain your answer.
2	A travelling salesman wishes to visit a number of towns and then return to his starting point. Given the travelling times between towns, how should he plan his itinerary so that he visits each town exactly once and travels in all for as short a time as possible?
3	In his job, a postman picks up mail at the post office, delivers it, and then returns to the post office. He must, of course, cover-each street in his area at least once. Subject to this condition, he wishes to choose his route in such a way that he walks as little as possible. Explain it.
4	In a school, there are m teachers $X_1, X_2, \bullet\bullet\bullet, X_m$, and n classes $Y_1, Y_2, \bullet\bullet\bullet, Y_n$. Given that teacher X_i is required to teach class Y_j for P_{ij} periods, schedule a complete timetable in the minimum possible number of periods.
5	Consider the situation that some chemicals are to be shipped together. The cost of shipping one container is Rs. 1000/-. Not all chemicals can be packed into a single container as there is a fear of reaction due to interaction between chemicals. Provide a graph theoretic way for modeling the above problem. What will be the minimum cost to ship following set of 8 chemicals labeled from C1 to C8 which are given along with their interactions that should be avoided with other chemicals? C1 : C2,C3,C5,C8 C2 : C5,C6,C8 C3 : C5,C7 C4 : C6,C7,C8 C5 : C6,C7,C8

	C6 : C8
6	(i)Explain bipartite graph with an example. Show that the maximum number of edges in a complete bipartite graph of n vertices is $\lfloor n^2/4 \rfloor$. (ii) Suppose there are cottages on a plane and each needs to be connected to the water, gas, and electricity companies. Without using a third dimension or sending any of the connections through another company or cottage, is there a way to make all nine connections without any of the lines crossing each other? Give reasons for your answer.
7	Use paths either to show that these graphs are not isomorphic or to find an isomorphism between them.  *G* *H*
8	Determine whether the graph shown has an Euler circuit or Hamilton circuit. If no Euler or Hamilton circuit exists, determine whether the graph has an Euler path or Hamilton path. If so, find such a path. If it does not, give an argument to show why no such path exists. 

Rubrics

	Needs Improvement (1)	Beginner (2)	Intermediate (3)	Advanced (4)	Proficient (5)
Ability to understand, Summarize problem, question, or Issue (5 Marks)	Not able to identify the problem / issue and summarize the data	Able to identify the Problem, but some aspects are confused or incorrect	Able to identify the Problem, and interpret	Able to identify the Problem, Challenges associated with the Problem and propose a problem statement / Hypothesis of his own	Able to identify the Problem, Challenges associated with the Problem and propose a problem statement / Hypothesis of his own Identifies integral relationships essential to analyzing the issue.
Ability to understand context and Assumptions/ inputs Of the Domain (5 Marks)	Not able to identify the Input Data Set/Assumptions	Ability to understand the input dataset / Assumptions and create a Summary.	Ability to understand information extraction / Output from input dataset	Extract values of all Parameters from input data set.	Able to identify the problem inputs and able to make functions
Ability to Process input with Appropriate function/ Logic and Methods (5 Marks)	No evidence of selection of appropriate function /Logic and Methods	Able to identify function/Logic and method But not able to Correlate Process input Data on it.	Able to correlate and Process input Data but not able to interpret it	Able to interpret Data but not able to rectify errors and Bias from it	Data has been processed on methods with no error and biasness.
Able to get Result as Desired (5 Marks)	Incorrect method / Logic so no result	Method/Logic is correct but intermediate result is erroneous	Intermediate result is correct but after correlation no desired output	Out Put is in approximation with desired Result	OutPut is as per desired result
Ability to provide conclusions, implications, and consequences	Not able to provide Conclusions and relate with the problem	Fails to identify conclusions, implications, and consequences, or conclusion is a simplistic	Conclusions are linked with the consequences	Presents implications that may impact other people or issues.	Identifies and discusses conclusions, implications, and consequences.

for the problem (5)	statement	summary.		Conclusions are drawn with	Considers context, assumptions, and evidence. Qualifies own assertions. Consequences are considered and integrated. Implications are developed and consider ambiguities.
Effective Communication (Verbal, Written) using graphs (5 Marks)	Not able to Communicate, High Level of Plagiarism in Document	Able to Communicate, but not effective, Plagiarism above 10% (if required) , Format is appropriate although at times inconsistent. Most sources are cited and used correctly	Errors are not distracting or frequent, although there may be some problems with more difficult aspects of style and voice.	Language clearly and effectively communicates ideas. May at times be nuanced and eloquent. Errors are minimal. Style is appropriate for audience.	Use of Language is concise, Plagiarism is less than 10%.